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ONTARIO WATER
RESOURCES COMMISSION

DUNNVILLE REGIONAL

WATER SUPPLY SYSTEM

ANNUAL REPORT

1960

PREPARED BY

THE DIVISION OF PLANT OPERATIONS

ONTARIO WATER RESOURCES COMMISSION

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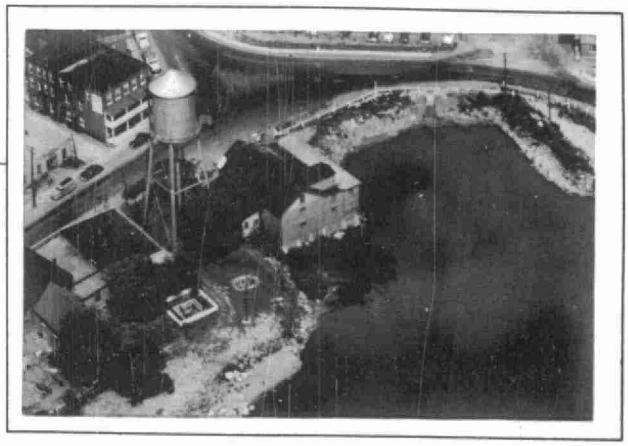
DUNNVILLE REGIONAL WATER SUPPLY SYSTEM



DUNNVILLE

GRAND

RIVER

MOULTON TWP.

PIPE LINE

DUNNVILLE

TOR. HAM. BUF. RWY.

PORT MAITLAND

DUNN TWP.

PORT MAITLAND PIPE LINE

SHERBROOKE TWP.

TREATMENT PLANT

INTAKE

LAKE ERIE

TD/227/D96/D86/1960/M0E
ASNJ

ANNUAL REPORT FOR YEAR ENDING DECEMBER 31, 1960.

DUNNVILLE REGIONAL WATER SUPPLY SCHEME

OWRC Project 58-W-17

GENERAL INTRODUCTION

In July 1957 the Town of Dunnville requested assistance from the Ontario Water Resources Commission to finance, construct and operate a new water treatment plant using Lake Erie as a source of supply.

Canadian British Engineering Consultants were engaged to prepare an initial report based on a new lake supply for the Town of Dunnville only. By the end of 1957 preliminary plans had been prepared and approved.

During 1958, two industries, the Sherbrooke Metallurgical Company Limited and the Electric Reduction Co. of Canada began building in the Port Maitland area. The possibility of four municipalities (Dunnville, Dunn Twp., Sherbrooke Twp. and Moulton Twp.) joining together with the OWRC to develop the lake supply was discussed but never materialized. By June 1958 it was therefore decided that the consulting engineers proceed with final plans and specifications for the "Dunnville only" scheme.

In the spring of 1959 the two new industries at Port Maitland estimated that they would require a water supply of 17 M.G.D. for their manufacturing processes. Through the efforts of the Commission, the requirements of the town and industries were co-ordinated and the consulting engineers proceeded to design for a regional water scheme.

The project was divided into four contracts:-

(A) Waterworks Intake and Crib Structure.

(B) Water Treatment Plant.

(C) Water Pipelines to Dunnville and Sherbrooke Township.

(D) Water Main under the Grand River at Port Maitland.

Tenders were called for:-

Contract A - September 4, 1959

Contract B - January 7, 1960

Contract C - January 7, 1960

Contract D - March 22, 1960.

Successful contractors were:-

Contract A - Dravo of Canada Limited - Toronto.

Contract B - Schwenger Construction Company Limited - Hamilton.

Contract C - Mathews Construction Limited - London.

Contract D - McNamara Construction Limited - Toronto.

Construction work was substantially completed approximately October 1, 1960.

DESCRIPTION OF SYSTEM

LOCATION

The plant is located four miles south of the Town of Dunnville on Lake Erie and one-half mile west of the main Dunnville-Lake Erie road.

INTAKE

The intake crib is constructed of 10" x 10" timbers and is 16' x 16' x 13' in size. The depth of the crib is approximately 22 feet below the minimum recorded lake level. The crib structure is located in a rock trench excavated in the lake bed. The bellmouth diameter is 96 inches. The asbestos bonded corrugated metal intake pipe is 1580 feet in length and 48 inches in diameter.

LOW LIFT PUMPING STATION

Two 36 inch diameter pipes branching from the single 48 inch diameter intake pipe connect into two wells from where the water flows through the screens to the pump suction wells.

(A) SCREENING

Raw water screening is accomplished by stationary screens with mechanical lifts. There are two sets in series, on each pump well. The screens are made of a bronze mesh with 0.10 inch diameter openings.

(B) CAPACITY OF PUMPING STATION

At present the low lift pumping station is equipped with three vertical, turbine, deep well pumps each rated to produce 4750 I.G.P.M. (20.5 M.G.D. total) against a total discharge head of 38 feet when all three pumps are working in parallel. These pumps are designed to operate under both parallel and solo operating conditions. The pumps are used to transfer untreated, coarsely screened lake water from the low lift pumping station sumps, to the micro-strainer building via a 30 inch diameter pipe approximately 100 feet long. Each pump is driven by a 75 HP vertical, hollow - shaft, squirrel cage induction motor. Provision has been made for the further addition of another pump and motor.

The operation of the four low lift pumps, one of which is always a stand-by, is controlled from two sets of six electrodes, one set in each part of the clear well in the high-lift pumping station.

MICRO-STRAINERS

The water from the low lift station passes to the micro-strainer building which contains 6 micro-strainers each 10 feet in diameter and 10 feet long. Each micro-strainer is equipped with Mark 0 fabric which has more than 160,000 apertures per square inch, the aperature size being little more than 20 microns. The equipment was designed specifically to remove algae but will, in addition, remove coarser suspended matter. Each micro-strainer is equipped with continuous washing facilities. The operation of the wash water pumps is linked to the operation of the low lift pumps.

These wash water pumps are used to supply water from the micro-strainer outlet channel to wash the fabric of the micro-strainers. These pumps start 40 seconds ahead of the low lift pumps, and stop 40 seconds after the low lift pumps stop. Provision has been made to by-pass any micro-strainer when maintenance is required or to by-pass all of the units in case of emergency.

CLEARWELL

Micro-strained water flows directly to a clear well, constructed in two sections each of which is 54' x 27.6' x 14' in size. Total volume of the clearwell is 260,000 Imp. Gals. Chlorine solution is added at the inlet, and by means of a baffle, thorough mixing is accomplished during an 18 minute contact period, before the water reaches the high lift pump suctions.

CHLORINATION

Two chlorinators, one of which is used as a stand-by, are used to supply chlorine to the clearwell. These units are automatically operated by the variable vacuum control and are each capable of metering 2,000 lbs. of chlorine per 24 hours. Varifying flows, which are measured by an orifice plate located in the low lift pump discharge line, are converted into a varying vacuum signal for automatic proportional control of the two chlorinators. Each chlorinator is also capable of feeding chlorine to one or both sections of the clear-well. When feeding chlorine to both sections of the clearwell it is possible to proportion the flow of chlorine to either section at any desired ratio, selected on a visual scale. An automatic detecting device instantly notifies the operator of any chlorine leaks.

The cylinder room, adjacent to the chlorinator room, houses two one-ton cylinders which are connected to the metering equipment. These two cylinders are mounted on scales enabling the operator to measure the daily consumption.

A large, covered, storage area is also provided so several weeks supply of chlorine can be kept on hand at all times.

HIGH - LIFT PUMPING STATION

DUNNVILLE SUPPLY

Mounted above the clearwell are three high lift pumps to serve the Town of Dunnville. Provision has been made for the future addition of a fourth. The lead pump which is the smallest is rated at 1000 I.G.P.M. against a total discharge head of 135 feet and is equipped with a horizontal drive 50 H.P. motor. It always operates alone in the system during periods of low demand. When the demand increases, operation is transferred to the remaining three larger pumps.

These pumps, two of which are presently installed, are each rated at 1200 I.G.P.M. against a total discharge head of 230 feet under parallel operating conditions, and are each equipped with horizontal drive 125 H.P. motors.

Each may be used alone and is rated at 1600 I.G.P.M under this condition. One of the three large pumps will always be a stand-by since two operating in parallel are capable of delivering full design flow, 3.5 M.G.D.

The pumps deliver water through a 16 inch diameter pipeline approximately 23,000 feet in length from the clearwell to the elevated tank or the filter plant in the Town of Dunnville.

The four high lift pumps will normally be controlled from a pressure operated transmitter located at the foot of the existing water tower in Dunnville. The transmitter is activated by changes in water level within the tank and the signals are relayed via telemetering lines to the new treatment plant. When it is found necessary to further treat the water leaving the plant the high lift pumps will be controlled by a float operated level transmitter located in the distribution trough to the filters at the old plant.

PORT MAITLAND SUPPLY

Four single stage, double suction pumps are used to transfer water under direct pressure from the clearwell to the industrial distribution system at Port Maitland. There are three constant speed pumps and one variable speed pump. When any two constant speed pumps and the varispeed (at maximum speed) are operating in parallel in the system each will produce 4,000 I.G.P.M. at a total discharge head of 220 feet. This combination will produce the full design flow of 17 M.G.D. leaving one constant speed pump always on standby. Three pumps are each driven by 350 HP constant speed squirrel cage induction motors. The fourth pump is driven by a 350 HP synchronous motor with an eddy current coupling for variable speed operation.

The pumps deliver water through a 36 inch diameter pipeline approximately 21,000 feet in length. The Grand River crossing was accomplished by constructing a tunnel approximately 520 feet in length and two vertical shafts approximately 65 feet in depth. The pipeline through the tunnel and the two shafts was constructed of concrete and has a 48 inch inside diameter.

Pressure and flow variations at the delivery point are sensed and telemetered to the plant to control the operation of the pumps. A minimum pressure of 75 psi is maintained at the delivery point in Port Maitland.

The variable speed pump acts as the lead pump. This pump has a rated capacity of 6,000 I.G.P.M. and 4,000 I.G.P.M. maximum capacity in parallel. It will deliver the required flow until a maximum of 6,000 I.G.P.M. is reached at which point it will be replaced by a constant speed pump and the variable speed will be throttled back to minimum delivery. Increased demand can be met by again increasing the variable speed pump to maximum output.

If demand continues to increase a second constant speed pump comes on the line and the variable speed drops to minimum delivery. If the demand increases up to a flow of 12,000 I.G.P.M. (17 MGD) it can then be met by increasing the output of the variable speed pump to maximum again.

OPERATION

A Local Advisory Committee was formed in July 1960 to enable the Division of Plant Operations to work in close co-operation with local authorities.

This committee is composed of the following persons:-

D.L. Featherstone	Mayor of Dunnville
J. Camelford	Chairman, Dunnville P.U.C.
R.J. Bennett	Managing Director, Sherbrooke Metallurgical Co. Ltd.
J. Kennerley	Manager, Finance & Legal - Electric Reduction Co. of Canada Ltd.
C.I. Robertson	Port Maitland Works Manager, Electric Reduction Co. of Canada Ltd.

Interviews were conducted in August and the following men are now employed at the plant.

Superintendent - R. Neff

Operators - A. Clark

J. Cowan

O. McLaughlin

A. Miller

R. Root.

The plant went into initial operation on September 28, 1960, but the Port Maitland pumps were not ready for operation. However, the Dunnville pumps were used to send water through the Port Maitland pipeline. The water was pumped to waste in a marsh near Port Maitland for a short period to permit checking of equipment.

During the first week of October, water was supplied to the Sherbrooke Metallurgical Co. during the day. There were several minor mechanical and electrical difficulties which were corrected by the OWRC plant staff, contractor and equipment suppliers. On Tuesday, October 11, 1960, a break occured in the temporary line crossing the Grand River, and the plant was temporarily shut down. During this period the low lift well, micro-strainer compartments, and the clear-well were dewatered, enabling the consulting engineers to inspect the plant thoroughly and prepare the final deficiency list. The temporary line across the river was ready for operation on Wednesday morning October 26th, 1960, and pumping was resumed. The valves at Port Maitland were not operating satisfactorily and it was again necessary to shut the plant down. During the evening the crib was placed in position on the intake line and pumping was resumed on a 24 hour basis on October 27, 1960.

Operations throughout the month of November were reasonably normal. The Dunnville pumps were controlled manually and continued to supply the Sherbrooke Metallurgical Co. with water on a 24 hour basis. On November 9, delegates from the South Central Ontario Water Works Conference toured the plant and were supplied with details on the operation.

On November 30th the Dunnville pipeline was flushed and sterilized. The Dunnville filter plant began receiving lake water on December 1, 1960 and the pumps were placed on automatic control. The variable speed pump was operated manually to satisfy the Port Maitland demand. Throughout December considerable trouble was experienced with the float control in the filter plant. It was frequently necessary to operate the Dunnville pumps manually until the trouble was located. On December 20th the permanent 48 inch line under the Grand River to Port Maitland was placed in operation.

Since start up it has been necessary to send all of the Dunnville water through the filter plant because of the high turbidity of the lake supply.

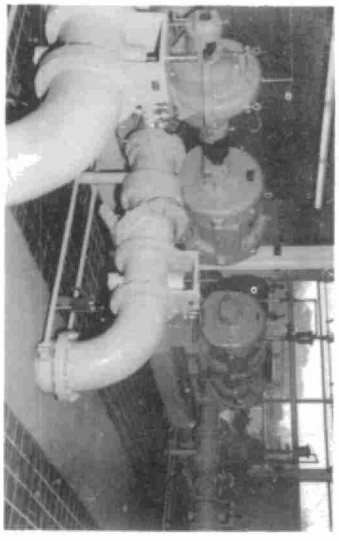
A weekly sampling routine has been put into effect. Samples of the raw water, and of the treated water at the end of the Dunnville and Port Maitland pipelines are collected and shipped to the OWRC laboratories in Toronto for bacteriological analysis. In addition to the above, several daily tests are carried out in order to observe the quality of the water and make changes in the treatment process. Operating data and laboratory results are recorded daily and submitted on a weekly basis to the Division of Plant Operations. In this manner the plant is operated in an economical and efficient manner.

Operating expenses include the following; payroll, fuel, power, chemicals, general supplies, equipment, maintenance and repairs and miscellaneous items. The total operating costs incurred during the year 1960 amounted to $13,220.43. The total estimated operating expenses excluding insurance for the year 1961 will amount to $114,400.00. Frequent inspection visits are made by the mechanical and electrical technicians, the project engineer and other members of the Division of Plant Operations, which is a service supplied by the OWRC.

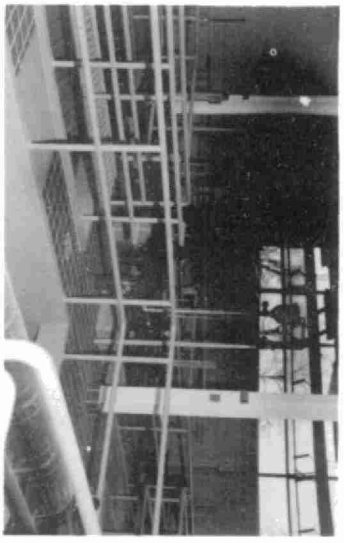
In conclusion it might be pointed out that start-up difficulties, of which only a few have been mentioned, are not uncommon in a project of this magnitude. Mr. R. Neff and his staff of operators have done an excellent job at the plant, and have conscientiously endeavoured to see that the Town of Dunnville and the Port Maitland industries have received a constant and satisfactory supply of water.

CHLORINATING EQUIPMENT

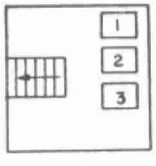
LOW LIFT MOTORS



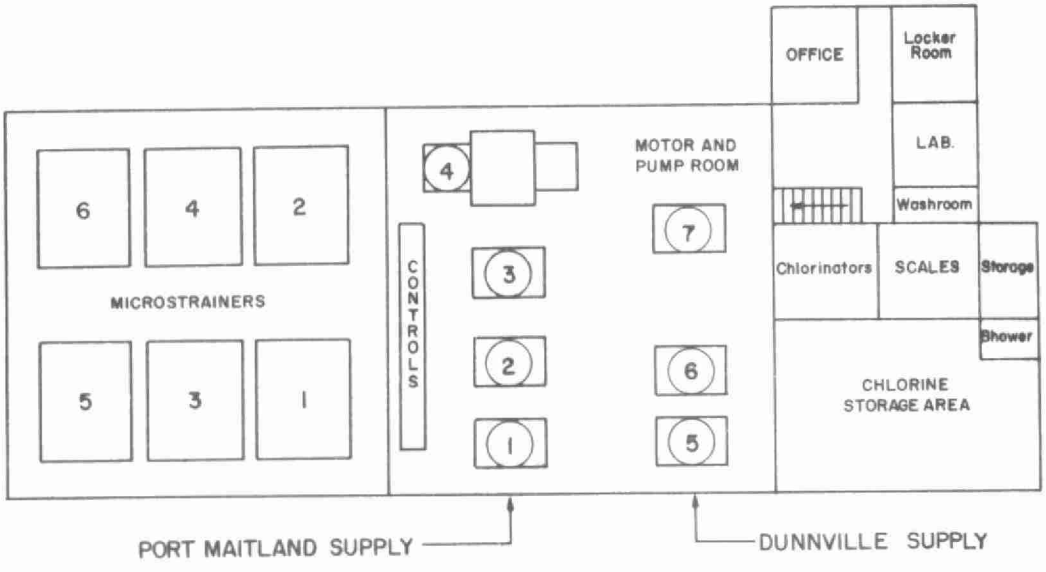
TREATMENT PLANT EQUIPMENT



MICROSTRAINERS



LOW LIFT STATION



LIFT STATION AND TREATMENT PLANT

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